GCSE
MATHEMATICS
8300/2F

Foundation Tier Paper 2 Calculator

Mark scheme

November 2019

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq$ value $< b$
3.14 …	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

Question	Answer	Mark	Comments
1	6*a*	B1	
	Additional Guidance		
2	22	B1	
	Additional Guidance		
3	1 h 45 min	B1	
	Additional Guidance		
4	**Q**	B1	
	Additional Guidance		

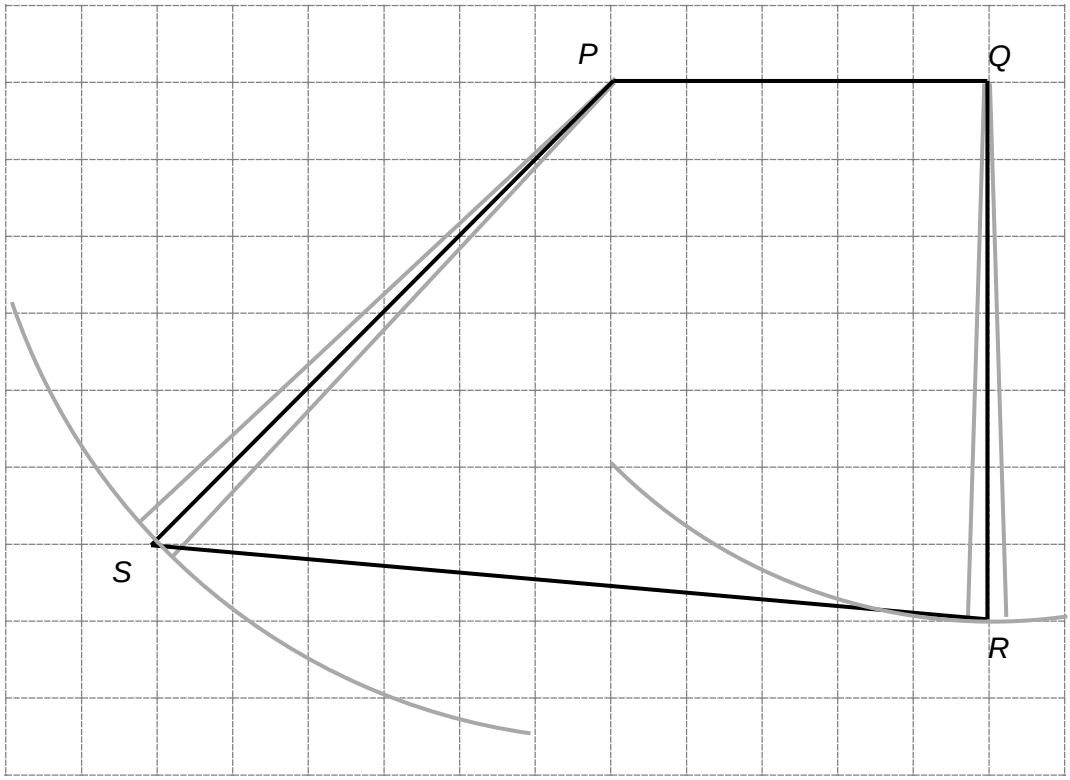
Question	Answer	Mark	Comments
5(a)	11	B1	
	Additional Guidance		
	Must be seen in this part		
5(b)	3 4 4 5 9 10 12 14 or 14 12 10 9 5 4 4 3 or 3 4 4 5 9 or 14 12 10 9 5 or $\frac{5+9}{2}$ or 5 and 9 chosen	M1	allow one omission, extra or transcription error in a full list
	7	A1	
	Additional Guidance		
	Allow the ordered list to be seen by the given list or in part (a) even if part (b) is blank but not if the mean is calculated in part (b)		
	Correct ordering but calculates mean		M0A0
	Answer 7.6…		M0A0
	NB 3 + 4 = 7		M0A0
	Answer 7 from any or no list but not from 3 + 4		M1A1

Question	Answer	Mark	Comments
6	3 × 42 or 126 or 5 × 42 or 210	M1	implied by 121 or 190 or 84
	3 × 42 – 5 or 121 or 5 × 42 – 20 or 190	M1dep	oe
	69 or 69.00(p)	A1	69p is A0
	Additional Guidance		
	121 or 190 seen		M1M1
	121 ÷ 3 or 190 ÷ 5		M1M1A0
	Do not allow a misread of the discounts		
	Follow through the correct discount for their misread of a dress price eg for a misread of £42 as £24 24 × 3 = 72 and no discount required so M1 max but 24 × 5 = 120 and 120 – 5 = 115 could score M1M1		
	A misread of the number of dresses must be > 3 for Amira and > 5 for Bobbi		
7(a)	–5	B1	
	Additional Guidance		
	–5 + 17 = 12 or 17 – 5 = 12 but –5 not selected as answer		B0
7(b)	48	B1	
	Additional Guidance		
	48 seen but 12 given as answer		B0
	Answer $\frac{48}{4}$		B0

Question	Answer	Mark	Comments
7(c)	$\frac{3}{4}$ or 0.75	B2	B1 partial simplification eg $\frac{3m}{4m}$ or $\frac{0.75m}{m}$ or $\frac{9}{12}$
	Additional Guidance		
	eg $\frac{3m}{4m}$ seen but answer given as $0.75m$		B1
8	£15	B1	
	Additional Guidance		
9	40	B2	B1 correct proportion seen eg $\frac{10}{25}$ or $\frac{2}{5}$ or 0.4 or $\frac{20}{50}$ or $10 \div 25 \times 100$ oe or correctly evaluates their number of shaded squares × 4 or answer 60
	Additional Guidance		
	10 ÷ 25 or 10 out of 25 in words or ratio used (unless recovered)		B0
	eg $\frac{11}{25}$ seen with answer 44		B1
	eg 7 (shaded) seen with answer 28		B1

Question	Answer	Mark	Comments
10	40 ÷ 5 or 8	M1	may be seen on diagram eg 8 in one of the circles or as a key implied by ◖ = 4
	their 8 × 3.5 or their 8 + their 8 + their 8 + $\frac{\text{their 8}}{2}$	M1dep	oe calculation that would evaluate to 28 eg 8 + 8 + 8 + 4 or 3 × 8 + 4 or their 4 × 7
	28	A1	
	Additional Guidance		
	Answer 28		M1M1A1
	Condone recovery eg 8 × 3 + $\frac{1}{2}$ = 28		M1M1A1
	Only eg 8 × 3 + $\frac{1}{2}$ with no recovery to 28		M1M0A0
	Further work eg 8 × 3.5 = 28, 28 × 4 (and answer 112)		M1M0A0
	eg Chicken = 8 + 16 + 24 + 28		M1M0A0

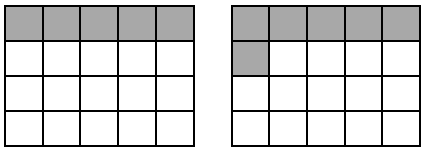
Question	Answer	Mark	Comments
11	54	B2	B1 $(c =) -6$ or $(d =) -9$ or $(cd =) -\frac{1512}{-28}$ oe fraction or $(cd =) \frac{1512}{28}$ oe fraction
	Additional Guidance		
	Answer 54 with any or no working		B2
	$(c =) -6$ or $(d =) -9$ seen even if not subsequently used		B1
	$(c =) -6$ or $(d =) -9$ may be seen by the given calculations		B1
	$250 - 16^2 \times -9 = 2554$		B1
	$250 - 16^2 \times \frac{18 \times 14}{-28} = 2554$		B0
	Answer 2554 with no working		B0
12	B H B T G H G T R H R T W H W T with no errors or repeats	B2	any configuration accept words B1 five of BT GH GT R H R T W H W T
	Additional Guidance		
	eg T B means B T so if both seen it is a repeat		
	Condone repeats or errors for B1 but not B2		
	Allow B H to be written again if list restarted		
	Do not count clear working as a repeat eg table used to work out combinations and then separate list given as answer		

Question	Answer	Mark	Comments
13	Angle *PQR* = [88°, 92°] and line from *Q* = [6.8, 7.2] cm and angle *QPS* = [133°, 137°] and line from *P* = [8.3, 8.7] cm and complete quadrilateral	B4	B3 at least three of the four measuring criteria met B2 any two of the measuring criteria met B1 any one of the measuring criteria met Length of *QR* must be within 2 mm of the right-hand arc shown below Length of *PS* must be within 2 mm of the left-hand arc shown below
	Additional Guidance		
			
	Ignore labels if present		
14	triangular prism	B1	
	Additional Guidance		

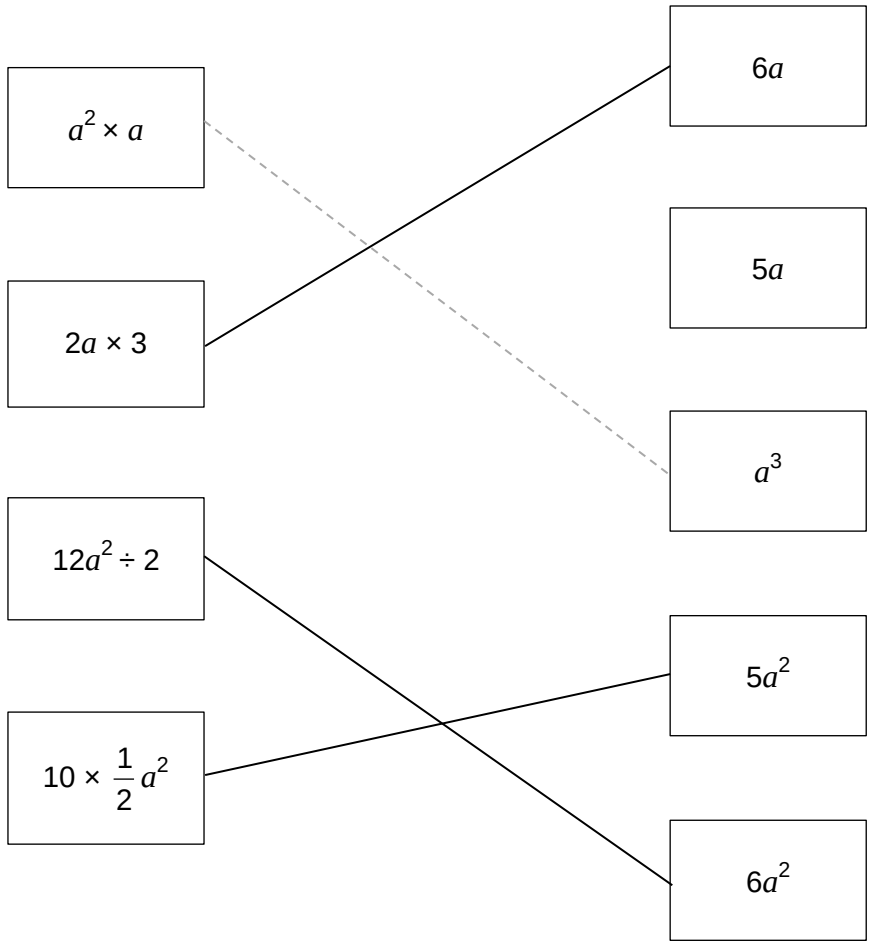
Question	Answer	Mark	Comments
15	**Alternative method 1**		
	0.75 or 1.3	M1	decimal or percentage eg 75(%) or 130(%)
	0.75 and 1.3 and $\frac{3}{4}$ oe	A1	oe decimal or percentage eg 75(%) and 130(%) and $\frac{3}{4}$ oe
	Alternative method 2		
	0.25 or 0.3	M1	decimal or percentage eg 25(%) or 30(%)
	0.25 and 0.3 and $\frac{3}{4}$ oe	A1	decimal or percentage eg 25(%) and 30(%) and $\frac{3}{4}$ oe
	Alternative method 3		
	Converts both fractions to valid common denominator with at least one numerator correct	M1	eg $\frac{15}{20}, \frac{26}{20}$ (both numerators correct) or $\frac{30}{40}, \frac{54}{40}$ (one numerator incorrect)
	Two correct fractions with valid common denominator and $\frac{3}{4}$ oe	A1	eg $\frac{15}{20}$ and $\frac{26}{20}$ and $\frac{3}{4}$ oe or $\frac{7.5}{10}$ and $\frac{13}{10}$ and $\frac{3}{4}$ oe
	Alternative method 4		
	Converts $\frac{1}{4}$ and $\frac{3}{10}$ to valid common denominator with at least one numerator correct	M1	eg $\frac{5}{20}, \frac{6}{20}$ (both numerators correct) or $\frac{10}{40}, \frac{16}{40}$ (one numerator incorrect)
	Two correct fractions with valid common denominator and $\frac{3}{4}$ oe	A1	eg $\frac{5}{20}$ and $\frac{6}{20}$ and $\frac{3}{4}$ oe or $\frac{2.5}{10}$ and $\frac{3}{10}$ and $\frac{3}{4}$ oe

Additional Guidance is on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
15 cont	If answer line blank allow $\frac{3}{4}$ to be indicated by eg circling the correct fraction	
	Allow $\frac{3}{4}$ to be given as a correct equivalent form eg Alt 1 0.75 and 1.3 and answer 0.75	M1A1
	Ignore + or – when calculating difference from 1 eg Alt 2 accept 0.25 and –0.3 or –0.25 and 0.3 or –0.25 and –0.3	
	In Alt 1 if further work is seen eg to calculate the differences then these must be correct and comparable for the A1 eg 0.75 and 1.3 and 25 and 30 (correct change to %) Answer $\frac{3}{4}$ eg 0.75 and 1.3 and 0.25 and 30 (not comparable) Answer $\frac{3}{4}$ eg 0.75 and 1.3 and 0.15 and 0.3 (one incorrect) Answer $\frac{3}{4}$	M1A1 M1A0 M1A0
	Diagrams are acceptable if clear eg  and answer $\frac{3}{4}$	M1A1
	NB the reciprocal of $\frac{3}{4}$ is 1.3… which may be seen truncated to 1.3	M0
	1 – 0.75 = 0.25, 1 + 0.25 = 1.25 and 1.3 seen and answer $\frac{3}{4}$	M1A1
	1.3 – 1 = 0.3, 1 – 0.3 = 0.7 and 0.75 seen and answer $\frac{3}{4}$	M1A1
	Alt 3 eg $\frac{15}{20}$ and $1\frac{6}{20}$ and answer $\frac{3}{4}$	M1A1

Question	Answer	Mark	Comments
16	20	B3	B2 (A : B : C =) 12 : 6 : 2 or (A : B =) 12 : 6 **and** (B : C =) 6 : 2 or A = 12 **and** C = 2 B1 (A : B : C =) 6 : 3 : 1 oe or (A : B =) 12 : 6 or (B : C =) 6 : 2 or A = 12 or C = 2
	Additional Guidance		
	Allow clear indication that A is 12 or C is 2		
	6 : 3 : 1 must be a single ratio for B1		
	m : 6 : 2		B1
	12 : 6 : n		B1

Question	Answer	Mark	Comments
17	All 3 correct	B3	B1 for each box in Column P correctly matched
	Additional Guidance		
	Connections do not have to be straight lines		
	Two or more lines from a box in Column P is choice so is incorrect for that box		
			B3

Question	Answer	Mark	Comments
18	**Alternative method 1**		
	120 × 2 or 240 and 120 × 3 or 360	M1	2 may be [2, 2.75) and 3 may be (2.75, 3]
	450 – 120 or 330	M1	
	240 and 360 and 330 and Yes	A1	correct values using their [2, 2.75) and their (2.75, 3] comparing with 330
	Alternative method 2		
	120 × 2 or 240 and 120 × 3 or 360	M1	2 may be [2, 2.75) and 3 may be (2.75, 3]
	their 240 + 120 or 360 and their 360 + 120 or 480	M1dep	oe
	360 and 480 and Yes	A1	correct values using their [2, 2.75) and their (2.75, 3] comparing with given 450
	Alternative method 3		
	450 – 120 or 330	M1	
	their 330 ÷ 120 or 2.75	M1dep	oe eg 450 ÷ 120 – 1 or 3.75 – 1 is M2
	2.75 and Yes	A1	comparing with given 2 and 3
	Alternative method 4		
	450 – 120 or 330	M1	
	their 330 ÷ 2 or 165 and their 330 ÷ 3 or 110	M1dep	2 may be [2, 2.75) and 3 may be (2.75, 3]
	165 and 110 and Yes	A1	correct values using their [2, 2.75) and their (2.75, 3] comparing with given 120

Alternative method 5 and Additional Guidance are on the next page

Question	Answer	Mark	Comments
18 cont	**Alternative method 5**		
	2 + 1 or 3 and 3 + 1 or 4	M1	3 may be [3, 3.75) and 4 may be (3.75, 4]
	120 × 3 or 360 **and** 120 × 4 or 480 or 450 ÷ 3 or 150 **and** 450 ÷ 4 or 112(.5)	M1dep	oe 3 may be [3, 3.75) and 4 may be (3.75, 4]
	360 and 480 and Yes or 150 and 112(.5) and Yes	A1	comparing with given 450 or comparing with given 120
	Additional Guidance		
	Use the method that gives the most marks even if there are multiple attempts		
	Yes may be seen by the question or implied by eg It is between 2 and 3 times		
	450 ÷ 120 only or 3.75 only		M0
19	✓ All four triangles are right-angled ☐ All four triangles are isosceles ✓ All four triangles are congruent ✓ Area of rhombus = 4 × area of one triangle ☐ Perimeter of rhombus = 4 × perimeter of one triangle	B2	B1 two correct with at most one incorrect or three correct and one incorrect
	Additional Guidance		

Question	Answer	Mark	Comments
20(a)	**Alternative method 1** shown by valid calculation		
	1500 × 100 or 30 000 × 5 or 1500 ÷ 5 or 30 000 ÷ 100 or 5 ÷ 100 or 1500 × 100 ÷ 5 or 30 000 × 5 ÷ 100 or 1500 × 100 ÷ 30 000	M1	must see one of these calculations but may evaluate incorrectly for M1 do **not** allow embedded in an invalid calculation eg 30 000 × 5 ÷ 1000 is M0
	$\frac{1500\times100}{5} = 30\,000$ or $\frac{30\,000\times5}{100} = 1500$ or $\frac{1500\times100}{30\,000} = 5$ **and** $AB = 5$ or 1500 × 100 = 30 000 × 5 or 1500 ÷ 5 = 30 000 ÷ 100	A1	must show correct use of all four of 1500, 100, 5 and 30 000 may be in two stages eg 1500 × 100 = 150 000 **and** 150 000 ÷ 5 = 30 000 or 1500 ÷ 5 = 300 **and** 30 000 ÷ 100 = 300 if units shown must be correct for A1

Alternative method 2 and Additional Guidance are on the next page

Question	Answer	Mark	Comments
20(a) cont	**Alternative method 2** shown by unit conversion and valid calculation		
	150 000 cm or 300 m or 0.05 m	M1	correct units must be shown to imply use of 100
	150 000 cm **and** 30 000 × 5 = 150 000 or 150 000 cm **and** 150 000 ÷ 5 = 30 000 or 150 000 cm **and** 150 000 ÷ 30 000 = 5 **and** *AB* = 5 or 30 000 cm **and** 300 m **and** 1500 ÷ 5 = 300 or 30 000 cm **and** 300 m **and** 300 × 5 = 1500 or 30 000 cm **and** 300 m **and** 1500 ÷ 300 = 5 **and** *AB* = 5 or 0.05 m **and** 1500 ÷ 0.05 = 30 000 or 0.05 m **and** 30 000 × 0.05 = 1500	A1	correct units must be shown
	Additional Guidance		
	30 000 × 5 may be seen as a correct build-up ie 30 000, 60 000, 90 000, 120 000, 150 000		
	Measuring *AB* as a value other than 5 will score M1 max		
	Using *AC* or *BC* can only score a max of M1 for one of the calculations or conversions that does not use *AB*		
	Allow M1 even if seen among other incorrect work but for A1 their method must be all correct and unambiguous		
	Must show a calculation from Alt 1 or a value with units from Alt 2 for the M1 ie 150 000 only or 300 only or 0.05 only is M0		
	Ignore any additional reference to the grid having 100 squares		

Question	Answer	Mark	Comments
20(b)	**Alternative method 1** working in cm		
	[4.4, 4.6]	B1	may be on diagram
	their [4.4, 4.6] × 30 000 or [132 000, 138 000]	M1	their *AC* must be in the range [4, 7] and must **not** be 5 [132 000, 138 000] implies B1M1 if no measurement for *AC* given
	their [132 000, 138 000] ÷ 100 ÷ 1000	M1dep	oe must be converting into km
	[1.32, 1.38]	A1ft	ft B0M2
	Alternative method 2 working in cm		
	[4.4, 4.6]	B1	may be on diagram
	$\frac{\text{their [4.4, 4.6]}}{5} \times 1500$ or their [4.4, 4.6] × 300 or [1320, 1380]	M1	their *AC* must be in the range [4, 7] and must **not** be 5 [1320, 1380] implies B1M1 if no measurement for *AC* given
	their [1320, 1380] ÷ 1000	M1dep	oe must be converting into km
	[1.32, 1.38]	A1ft	ft B0M2
	Alternative method 3 working in mm		
	[44, 46]	B1	may be on diagram
	their [44, 46] × 30 000 or [1 320 000, 1 380 000] or $\frac{\text{their [44, 46]}}{50} \times 1500$ or their [44, 46] × 30 or [1320, 1380]	M1	their *AC* must be in the range [40, 70] and must **not** be 50 [1 320 000, 1 380 000] implies B1M1 if no measurement for *AC* given [1320, 1380] implies B1M1 if no measurement for *AC* given
	their [1 320 000, 1 380 000] ÷ 10 ÷ 100 ÷ 1000 or their [1320, 1380] ÷ 1000	M1dep	oe must be converting into km
	[1.32, 1.38]	A1ft	ft B0M2

Additional Guidance is on the next page

Question	Answer	Mark	Comments

20(b) cont	**Additional Guidance**	
	Answer only in range [1.32, 1.38]	B1M1M1A1
	Answer must match their *AC* if seen	
	Must be using the scale 1 : 30 000 or 5 : 1500	
	Their [4.4, 4.6] is often 4 (perhaps counting squares crossed diagonally) or 6 (perhaps 2 down and 4 across)	
	4 seen and answer 1.2	B0M1M1A1ft
	4 seen and 120 000 (by Alt 1) or 4 seen and 1200 (by Alt 2)	B0M1M0A0
	Answer 1.2 (without 4 seen)	Zero
	6 seen and answer 1.8	B0M1M1A1ft
	6 seen and 180 000 (by Alt 1) or 6 seen and 1800 (by Alt 2)	B0M1M0A0
	Answer 1.8 (without 6 seen)	Zero
	4.7 seen and answer 1.41	B0M1M1A1ft
	4.7 seen and 141 000 (by Alt 1) or 4.7 seen and 1410 (by Alt 2)	B0M1M0A0
	Answer 1.41 (without 4.7 seen)	Zero
	Using Pythagoras gives $AC = \sqrt{20}$ or $2\sqrt{5}$ or 4.4(72…) or 4.5	B1

21	2 and 7 or 2 and 13 or 2 and 19	B2	either order B1 any pair of **different** numbers chosen from 2, 3, 5, 7, 11, 13, 17, 19 eg 2 and 3 or 3 and 5
	Additional Guidance		
	Mark the answer line but, if answer line blank, the pair of numbers must be clearly selected for B2 or B1		
	List of prime numbers without selecting a pair		B0

Question	Answer	Mark	Comments
22	9 × 5 or 45 or 9 × 3 or 27 or 5 × 3 or 15	M1	may be multiplied by 2 implied by 90 or 54 or 30 or (total =) 174 or 90 + 54 + 30 = 174
	9 × 5 × 2 or 90 **and** 9 × 3 × 2 + 5 × 3 × 2 or 54 + 30 or 84 or 9 × 5 or 45 **and** 9 × 3 + 5 × 3 or 27 + 15 or 42	M1dep	accept blue = 90 and (total =) 174 or green = 84 and (total =) 174
	90 and 84 and Yes or 45 and 42 and Yes	A1	oe condone incorrect units
	Additional Guidance		
	Yes may be seen by the question or implied by eg blue is bigger		
	Ticking or circling blue or 90 without a comment does not imply Yes		
	Allow M1 even if not subsequently used		
	Allow M1 even if seen among other calculations for eg perimeter or volume		
	Works out the area of a face and then uses this for the 'volume' eg 5 × 3 = 15, 15 × 9 = 135 or 5 × 3 = 15, 15 × 15 = 225		M1M0A0
	Only works out a 'volume' with correct or incorrect method eg 5 × 3 × 9 = 135 or 5 × 3 × 5 × 3 = 225		M0M0A0
	Ignore incorrect subtraction eg 90, 84 and Yes blue is 8 greater		M1M1A1
	90 + 54 + 30 = 174 (174 ÷ 2 = 87) 90 is more than half so Yes or 84 is less than half so Yes		M1 M1A1
	Only 90 and 174 without identifying 90 as the blue area		M1M0A0

Question	Answer	Mark	Comments
23	**Alternative method 1**		
	1 – 0.4 – 0.25 or 0.35	M1	oe fraction or percentage
	their 0.35 × 80	M1dep	oe
	28	A1	
	Alternative method 2		
	0.4 × 80 or 32 and 0.25 × 80 or 20	M1	oe eg (0.4 + 0.25) × 80 or 0.65 × 80 or 52
	80 – their 32 – their 20	M1dep	oe eg 80 – their 52
	28	A1	
	Additional Guidance		
	Answer 28 out of 80		M1M1A1
	Answer $\frac{28}{80}$		M1M1A0
	Allow M1 even if not subsequently used		
	28 seen but answer given as 0.35		M1M0A0

Question	Answer	Mark	Comments
24	720	B2	B1 at least 3 multiples of 120 (> 120) and at least 3 multiples of 144 (> 144) eg 240 360 480 and 288 432 576 or (120 =) $2 \times 2 \times 2 \times 3 \times 5$ or (144 =) $2 \times 2 \times 2 \times 2 \times 3 \times 3$ or (Answer =) $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$ or (Answer =) $2^4 \times 3^2 \times 5$ or (Answer =) any multiple of 720 (> 720) eg 1440 or 17 280

Additional Guidance	
Prime factor responses for B1 may be in index form eg (120 =) $3 \times 5 \times 2^3$	B1
Prime factor responses for B1 may be seen on a factor tree or a Venn diagram or in repeated division eg1 2 2 2 3 5 on a factor tree for 120 eg2 2 2 2 2 3 3 inside one circle on a Venn diagram	 B1 B1
For B1 allow some incorrect multiples if 3 correct of each eg1 240 380 480 720 900 (3 correct) and 288 432 576 868 (3 correct) eg2 Answer 1440 but some incorrect multiples seen	 B1 B1
Any multiple of 720 (> 720) given in unsimplified form eg1 $2^7 \times 3^3 \times 5$ eg2 $2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 3 \times 3$	 B1 B1
B1 can still be awarded even if subsequently works out HCF	
Answer 720 with some incorrect multiples seen	B2
For products of prime factors, ignore inclusion of $\times 1$	

Question	Answer	Mark	Comments
25(a)	Positive	B1	accept +ve or +
	Additional Guidance		
	Ignore any reference to the strength of the correlation		
	As one jump increases so does the other so positive		B1
	As one jump increases so does the other		B0
25(b)	Straight line of best fit passing through (150, [504, 512]) and (180, [550, 558])	B1	accept if clear intention to draw a straight line ignore anything either side of the gates
	Correct reading $\pm\frac{1}{2}$ square for their straight line of best fit	B1ft	ft straight line with positive gradient accept if clear intention to draw a straight line ignore any working lines on the graph
	Additional Guidance		
	No line of best fit		B0B0ft
	Short straight line with positive gradient and correct reading $\pm\frac{1}{2}$ square for their line		B0B1ft
	Two lines of best fit, mark the line that leads to their answer		
	Two lines of best fit, no answer, apply the usual rules of choice		

Question	Answer	Mark	Comments
25(c)	Valid reason	B1	eg 195 cm is outside the range of values or cannot extrapolate
	Additional Guidance		
	Allow '195' or 'his jump' or 'it' to represent 195 cm		
	B1 responses - do **not** allow points/data/plots/results to be replaced by graph or line		
	195 exceeds the data		B1
	It is beyond/outside the data		B1
	195 is higher than 185		B1
	Nobody else jumped that high		B1
	His jump is more than the others		B1
	The correlation stops at 560		B1
	All the other points/data/plots/results are less than 195		B1
	The points/data/plots/results don't reach 195		B1
	The points/data/plots/results don't reach that far		B1
	The points/data/plots/results stop at 185		B1
	The pattern/trend/correlation may change after the points/data/plots/results		B1
	The pattern/trend/correlation may change		B0
	It doesn't fit the pattern/trend/correlation		B0
	Line is not long enough		B0
	No points at/near/around/close to 195		B0
	195 is anomalous or 195 is an outlier		B0
	Not enough data		B0
	This data is not on the graph		B0
	It is too different to the other points		B0
	Ignore extra statements that do not contradict a valid reason		

Question	Answer	Mark	Comments
26	**Alternative method 1**		
	110 ÷ 2 or 55 or 2 ÷ 110 or 0.018(1…) or 0.0182 or 44 ÷ 110 or 0.4 or 110 ÷ 44 or 2.5	M1	oe
	44 ÷ (110 ÷ 2) or 0.8 or $\frac{4}{5}$	M1dep	oe eg 2880 or calculation that would evaluate to 0.8 eg 2 ÷ 110 × 44 or 44 ÷ 110 × 2 or 2 ÷ (110 ÷ 44) or $\frac{110+44}{110\div 2} - 2$ or 2.8 – 2
	48	A1	
	Alternative method 2		
	110 ÷ 2 ÷ 60 or 0.916… or 0.917 or 0.92 or 2 × 60 ÷ 110 or 1.09(0…) or 1.091	M1	oe
	44 ÷ (110 ÷ 2 ÷ 60)	M1dep	oe calculation that would evaluate to 48 eg 44 × 2 × 60 ÷ 110
	48	A1	

Additional Guidance is on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
26 cont	Ignore units for M marks eg 55 miles	M1
	Do not award A1 if premature approximation for 48 seen eg (Alt 1) 0.018 × 44 = 0.8 Answer 48 (Alt 1) 0.018 × 44 = 0.792 and 0.792 × 60 = 47.52 Answer 48 (Alt 2) 44 ÷ 0.917 = 48 (Alt 2) 44 ÷ 0.917 = 47.9 Answer 48 (Alt 2) 44 × 1.09 = 48 (Alt 2) 44 × 1.09 = 47.96 Answer 48	 M2A1 M2A0 M2A1 M2A0 M2A1 M2A0
	48 followed by answer 2 h 48 min	M2A0
	48 followed by answer 168 min	M2A0
	Allow M1 even if not subsequently used	
	Alt 1 Working in seconds leading to 2880	M2

Question	Answer	Mark	Comments
27	$a = 7$	B2	B1 $3ax - 10a$ or $3ax = 21x$ or $3ax - 21x = 0$ or $3a = 21$ or $3a - 21 = 0$ or $21 \div 3$ oe or $-10a = 2b$ oe
	$b = -35$	B1ft	ft $-5 \times$ their a where $a \neq 0$
	Additional Guidance		
	Ignore collection error if correct expansion seen eg $3ax - 10a - 21x + 2b = 0$ (should be $-2b$)		B1
	Ignore incorrect simplification if correct expansion seen eg $3ax - 10a = -7ax$		B1
	Allow eg $a \times 3x$ for $3ax$		
	Allow eg $a3x$ for $3ax$		
	Embedded 7 with $a = 7$ not stated eg $7(3x - 10)$ or $7 \times 3x = 21x$ or $21 \div 7 = 3$		B1
	Allow B1 even if not subsequently used		

Question	Answer	Mark	Comments
28	$\frac{180-56}{2}$ or 62	M1	oe may be on diagram
	180 + their 62 or 360 – 56 – their 62	M1dep	oe eg 62 + 62 + 118
	242	A1	
	Additional Guidance		
	62 seen even if not subsequently used		M1
	Answer (0)62		M1M0A0
	56 only		M0
	242 seen but answer given as 62		M1M0A0
	242 seen but then further work eg 360 – 242 and answer 118		M1M0A0

Question	Answer	Mark	Comments
29	**Alternative method 1**		
	21 – 17 or 17 – 21 or 17 + 4 or 21 – 4 or (difference is) 4 or (7th term =) 21 + 4 or 25 or (4th term =) 17 – 4 or 13	M1	may be seen as 17 21 4 allow (difference is) –4
	17 + (100 – 5) × 4 or 17 + 95 × 4 or 17 + 380 or 21 + (100 – 6) × 4 or 21 + 94 × 4 or 21 + 376 or 17 – 4 × 4 + 99 × 4 or 1 + 99 × 4 or 1 + 396 or 17 – 5 × 4 + 100 × 4 or –3 + 100 × 4 or –3 + 400	M1dep	must be using 4 oe calculation that would evaluate to 397 5th term + 95 × 4 6th term + 94 × 4 1st term + 99 × 4 0th term + 100 × 4
	397	A1	
	Alternative method 2		
	$4n$	M1	oe eg $n \times 4$
	$4n - 3$	A1	oe
	397	A1	

Additional Guidance is on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
29 cont	Term to term rule described eg Add on 4 each time	M1
	$a + 5d = 21$, $a + 4d = 17$ only	M0
	Difference shown as 4 then eg $n + 4$	M1
	Only eg $n + 4$ or $3n + 4$	M0
	$4n - 3$ seen even if not subsequently used	M1A1
	$4n$ seen eg $4n + 13$ even if not subsequently used	M1
	Correct list going up in 4s stopping at 397	M1M1A1
	List going up in 4s with an error or not reaching 397	M1M0A0
	No subtraction seen and incorrect difference eg 17 21 (+3)	M0
	Alt 2 allow $n4$	M1
	$4n - 3 = 100$	M1A1A0
	Allow M1 even if not subsequently used	

Question	Answer	Mark	Comments
30	$\begin{pmatrix}11\\19\end{pmatrix}$	B2	B1 unsimplified equivalent single vector eg $\begin{pmatrix}3\times2+5\\3\times7-2\end{pmatrix}$ or answer $\begin{pmatrix}11\\m\end{pmatrix}$ or answer $\begin{pmatrix}n\\19\end{pmatrix}$ or $\begin{pmatrix}6\\21\end{pmatrix}$ seen
	Additional Guidance		
	Condone fraction line for B2 or B1 eg $\left(\frac{11}{19}\right)$		B2
	Answer $\begin{pmatrix}11\\m\end{pmatrix}$ must have m as a numerical value		
	Answer $\begin{pmatrix}n\\19\end{pmatrix}$ must have n as a numerical value		
	Must see the vector brackets to award any marks in the working eg $\begin{matrix}11\\19\end{matrix}$ or $\frac{11}{19}$ or $\begin{matrix}6+5\\21-2\end{matrix}$ or $\begin{matrix}6\\21\end{matrix}$		B0
	Unsimplified version may be awarded in the working but must be seen as a single vector eg $\begin{pmatrix}6+5\\21-2\end{pmatrix}$		B1
	$\begin{pmatrix}6\\21\end{pmatrix}$ may be awarded in the working if seen as a vector		B1

Question	Answer	Mark	Comments
31	120 000 × 1.05 or 126 000	M1	oe eg 120 000 + 0.05 × 120 000 may be implied by eg 144 000
	120 000 × 1.05^4 or $\frac{583\ 443}{4}$	M1dep	oe eg their 126 000 × 1.05 or 132 300 and their 132 300 × 1.05 or 138 915 and their 138 915 × 1.05
	145 860(.75) or 145 860.8(0) or 145 861 or 145 900 or 146 000	A1	if no value given implied by M2 seen and 150 000
	150 000	B1ft	ft any answer seen with > 2sf condone 150 000.00
	Additional Guidance		
	126 000 × 1.05^3		M1M1
	Answer only 145 860(.75) or 145 860.8(0) or 145 861 or 145 900 or 146 000		M1M1A1B0
	Answer only 150 000		Zero
	For year on year working allow rounding/truncation if method shown for up to M2A0B1ft eg 126 000 × 1.05 = 132 000 and 132 000 × 1.05 = 138 000 and 138 000 × 1.05 = 144 900 Answer 140 000		 M1 M1A0B1ft
	120 000, 126 000, 132 000, 138 000, 144 000 with no method shown does not imply truncation, this is just adding on 6 000 each year		M1M0A0
	120 000 + 4 × 0.05 × 120 000 or 120 000 + 0.2 × 120 000 implies M1		M1M0A0
	Misreads can score up to M2A0B1ft		
	Treat calculating 5 years as a misread but otherwise the wrong number of years eg 120 000 × 1.05^2 will score a maximum of M1M0A0B1ft		